Annex 1 of the International Space Station U.S. Payload Operations Data File Management Plan

International Space Station Operations

U.S. PODF Definition

Payload Operations Data File

January 1999

Baseline

National Aeronautics and Space Administration
International Space Station Program
Marshall Space Flight Center
Huntsville, Alabama
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ANNEX 1 OF THE INTERNATIONAL SPACE STATION
U.S. PAYLOAD OPERATIONS DATA FILE MANAGEMENT PLAN
U.S. PODF DEFINITION
MISSION OPERATIONS LABORATORY OPERATION CONTROL

CONCURRENCE

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ANNEX 1 OF THE INTERNATIONAL SPACE STATION

U.S. PAYLOAD OPERATIONS DATA FILE MANAGEMENT PLAN

U.S. PODF DEFINITION

MISSION OPERATIONS LABORATORY OPERATION CONTROL

(SSP 58700-ANX1)
BASELINE

JANUARY 1999

Boeing Defense & Space Group
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PREFACE

This document is the first Annex to the U.S. Payload Operations Data File (U.S. PODF) Management Plan (SSP 58700). It contains a description of the items which form the U.S. PODF. It also includes a brief description of the Space Shuttle Program (SSP) vs. the International Space Station Program (ISSP) division of responsibilities.

Listed below are the Annexes of the U.S. PODF Management Plan that expand the guidelines and policies of the U.S. PODF Management Plan into systems requirements, working agreements, and work techniques. The Annexes are separately published documents and are updated on an as-needed basis. The Payload Operations Integration Function (POIF) is responsible for the U.S. PODF Management Plan and for the individual Annexes.

Document	Title
Main Volume	U.S. PODF Management Plan (SSP 58700)
1.	U.S. PODF Definition, Annex 1 (SSP 58700-ANX1)
2.	U.S. PODF Configuration Control, Annex 2 (SSP 58700-ANX2)
3.	U.S. PODF Procedure Verification and Validation, Annex 3 (SSP 58700-ANX3)
4.	U.S. PODF Preparation and Publication Plan, Annex 4 (SSP 58700-ANX4)
5.	U.S. PODF Payload Display Implementation Plan, Annex 5 (SSP 58700-ANX5)
6.	U.S. PODF Payload Display Developers Guide, Annex 6 (SSP 58700-ANX6)

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SECTION 1, INTRODUCTION

1.1   PURPOSE

The U.S. PODF Definition Document, Annex 1 of the U.S. PODF Management Plan, provides detailed information on the various definitions used in the development and management of the U.S. PODF. This document also describes the various aspects of the U.S. PODF including its content, how procedures are classified, types of procedures utilized, documentation/display formats, on-board configurations, increment-support structures, procedure residency, and file delivery.

This document, an Annex of the U.S. PODF Management Plan, provides a general description of the U.S. PODF and defines the nominal configuration and content of both the electronic and paper articles, as well as electronic media, office supplies, and other related items.

This Annex defines and describes the files and other material which constitute the U.S. PODF. The information contained within this document applies to all U.S. PODF procedures and reference information.

In order to determine the latest version of this document, consult the document list on the POIF homepage. The latest version also may be accessed via the PODF homepage at http://snail.msfc.nasa.gov/station/oc/podf-welcome.html.

1.2   SCOPE

All International Partners (IP), US/Agenzia Spaziale Italiana (ASI), and the National Institute of Space Research of Brazil Payload Developers and multi-element payloads involved in U.S. PODF activities will abide by the guidelines published in this plan.

1.3   CHANGE AUTHORITY

This plan was developed under the authority vested in the MSFC ~~Mission Operations Laboratory (MOL)~~Flight Projects Directorate (FPD) and the POIF by the Operations Data File Control Board (ODFCB).   The ODF Management Plan (SSP 50252) describes the processes for definition, development, and control of all ODF procedures and information for the ISS program. The charter and scope of authority of the U.S. Payload Operations Data File Control Board (PODFCB) are defined in that document.

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1.4   PUBLICATION AND REVISION

The POIF, at MSFC, is responsible for overseeing the preparation, coordination, and maintenance of this document. The Chairman of the U.S. PODFCB approves and signs this document and all changes to it after approval by the U.S. PODFCB members.

If you have comments or questions on this plan, contact: ~~Lee Tucker (256) 961-1502, Lee.Tucker@pobox.tbe.com, or Julia Ogle (256) 961-2280, julie.ogle@pobox.tbe.com~~Mardi Wilkerson (256) 544-3269, mardi.wilkerson@msfc.nasa.gov.~~-~~

SECTION 2, DOCUMENTS

2.1   APPLICABLE DOCUMENTS

The following documents may include specifications, standards, guidelines, procedures, handbooks, and other special publications. These documents, of the exact issue shown, form a part of these requirements to the extent specified herein. Unless the exact issue and date are identified, the "Current Issue" cited in the contract Applicable Documents List applies. Inclusion of applicable documents herein does not in any way supersede the programmatic order of precedence.

SSP 30233, Rev. E	Space Station Requirements for Materials and Processes
SSP 50200-01	Station Program Implementation Plan, Volume 1: Station Program Management Plan
SSP 50200-07	Station Program Implementation Plan, Volume 7: Training
SSP 50200-08	Station Program Implementation Plan, Volume 8: Increment Execution Preparation
SSP 50200-09	Station Program Implementation Plan, Volume 9: Realtime Operation
SSP 50252	Operations Data File Management Plan
SSP 50253	Operations Data File Standards Document
SSP 50254	Operations Nomenclature
SSP 52000	Payload Data Set Blank Book
SSP 52000-PDS	Payload Data Set Blank Book
SSP 52000-PIA	Payload Integration Agreement (PIA)

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SECTION 3, CONTENT OF THE U.S. PODF

The ODF is the collection of all procedures and reference information that support Station on-board operations. The U.S. PODF is a component of the ODF. The procedures contained in the U.S. PODF are used by flight controllers, the on-board crew, and the on-orbit procedure executor software to operate and maintain Station payloads and payload systems. The U.S. PODF contains the following procedures:

A.   All U.S. payloads procedures, including U.S. payloads in other elements, executed manually or on U.S. processors.

B.   All ASI payloads procedures, including ASI payloads in other elements, executed manually or on U.S. processors.

C.   All National Institute of Space Research of Brazil payload procedures executed manually or on U.S. processors.

D.   Selected multi-element payloads procedures (e.g., Station-wide payload safing procedures).

E.   Selected joint systems/payloads procedures executed in U.S. element, including U.S. Payload Support System (PLSS) procedures.

F.   On-board payloads procedures for Laboratory Support Equipment (LSE) used in the U.S. element, or U.S. LSE used Station-wide.

G.   Reference information supporting U.S. PODF procedures (e.g., charts, schematics, error message definition information).

The term "selected" is used to denote procedures that may continue to be negotiated on a case-by-case basis during the operations phase of the program.

The procedures and reference files are categorized according to their execution mode, file type, procedure type, and media on which they are displayed.

3.1   PROCEDURE EXECUTION

Payload procedures are sets of instructions used by flight controllers, the on-board crew, and the on-orbit procedures executor software to fulfill specific tasks needed to operate and maintain Station payloads, Payload Support Systems (PLSS), and LSE under both nominal and off-nominal conditions. These sets of instructions can be executed in one of three ways: automated (via the procedure executor software), manually (via the crew and/or the

ground controllers), and semi-automated (combinations of manual and automated execution techniques).

3.1.1   Automated Procedures

Automated procedures are those procedures that are executed by an automated procedure executor software without human involvement. The procedure executor software, located on board the ISS, executes the procedures embodied in a compiled procedure script. This software reads and responds to a set of real-time commands that allows a user to control script execution. The procedure executor software reports/displays its execution status for use in monitoring procedure execution. During the execution of automated procedures, the crew can step through, interrupt, or skip portions of the procedures.

3.1.2   Manual Procedures

Manual procedures are viewed and executed, step by step, by the crew and/or flight controller on the Manual Procedure Viewer (MPV). The execution may be physical, e.g., open hatch, or may control on-orbit payloads, PLSS, and LSE through the multipurpose applications workstation displays on the ground or through the Station Support Computer (SSC) on orbit.

3.1.3   Semi-Automated Procedures

Semi-automated procedures are executed through crew or ground completion of manual steps and initiation of automated procedure steps.

3.2   FILE TYPE

The U.S. PODF is made up of baselined files. Increment update files and generic files are a subgroup of baselined files associated with an increment. In continuous operations, there will be new information, generic information that is static, and generic information that is being updated. This will be part of any increment. According to the content, verification and validation criteria, and applicability to multiple increments, each U.S. PODF file is baselined. If a procedure is new, it must be verified and validated prior to use for increment operations. If it already exists, but has undergone a significant change since its last formal verification and validation, it must be re-verified/validated. Once a procedure is verified and validated and placed in the baseline file, a Engineering Change Request (ECR) is required to change it, this includes generic files. For a more thorough description of configuration control and procedure validation, refer to the U.S. PODF Configuration Control, Annex 2 (SSP 58700-ANX2) and the U.S. PODF Procedures Verification and Validation, Annex 3 (SSP 58700-ANX3)

3.2.1   Baseline File

The baseline file contains the Final version of the procedures that are under continuous configuration control (also see Section 4.1 and the U.S. PODF Configuration Control, Annex 2 (SSP 58700-ANX2)). The schedule is for increment-specific procedures to be baselined at I-4.56 months.

3.2.2   Increment Update Files

Increment update files contain new procedures, procedures that are still under development, additions, changes, and/or procedures which are only applicable to a specific increment (also see Section 4.2).

3.2.3   Generic Files

Generic files contain procedures that will be used for more than one increment and will generally remain static with no increment-specific requirements. Generic files will follow the cycle of the first increment submitted. These could include Facility-specific hardware/software procedures, PLSS/LSE procedures, and any other procedures that span several increments.

3.3   PROCEDURE CLASSIFICATIONS

The U.S. PODF procedures are further categorized into classifications to establish coordination requirements necessary to support procedure production. These categories are payload procedures, joint payload/PLSS or LSE procedures, multi-element payload procedures, U.S. PLSS procedures, and U.S. LSE procedures.

3.3.1   Payload Procedures

U.S. payload procedures are procedures for U.S. payloads operated in the U.S. segment or any other segment. These procedures involve the nominal and off-nominal operation of U.S. payloads.

3.3.2   Joint Payload/PLSS (or LSE) Procedures

Joint payload/PLSS or LSE procedures are procedures that involve the coordinated operation of Station PLSS or LSE and Station payloads.

3.3.3   Multi-Element Payload Procedures

Multi-element payload procedures are procedures that involve the coordinated operation of Station payloads in one or more International Partner (IP) elements and the U.S. element. Selected multi-element payload procedures will reside in the U.S. PODF and are configuration managed by the U.S. PODFCB; all IPs will have access to these procedures and will participate in the configuration management process and Station-wide Payload Safing process.

3.3.4   U.S. PLSS Procedures

U.S. PLSS procedures are procedures that involve the coordinated operation of single U.S. PLSS as well as joint U.S. PLSS operations.

3.3.5   U.S. LSE Procedures

U.S. LSE procedures are procedures that involve the coordinated operation of single U.S. LSE component as well as joint U.S. LSE operations.

3.3.6   Ground Malfunction Procedures (Mals)

Ground Mals are resident on the ground and affect on-board payload, PLSS, and LSE configuration and operation. In most cases a similar or exact flight crew procedure may exist. Ground Mals are considered part of U.S. PODF and will follow approval and development cycle of crew procedures. In most cases, ground Mals will be developed jointly between Payload Developer and payload systems personnel. Users should follow the Crew Procedure Development Template. Any deviations should be coordinated with the U.S. PODF Increment Manager. Electronic files will be delivered to the PODF Manager via Payload Information Management System (PIMS) as with other procedures or the Online Project Management System (OPMS) until PIMS is available. The PODF Manager will collate all quick-response procedures into a paper integrated payload safing procedure which will reside on ground and on board.

3.3.7   Command and Data Handling (C&DH) Procedures

Nominal and alternate nominal procedures associated with the payload portion of the C&DH system.

3.3.8   Integrated Payload Operations Procedures

A procedure containing steps that involve operation of more than one system and/or payload.

3.3.9 TV and Photographic Operations Procedures

Procedures associated with setup of the photo and TV scenes for payload science requirements.

3.3.10 Payload Display and Control Guide

Reference material which documents payload displays and controls (panel layouts, etc.)

3.4 PROCEDURE TYPES

Each of the U.S. PODF procedures will be composed of one or more of the following file types: nominal, alternate nominal, quick response, malfunction, corrective procedures, and reference information. For simplicity, this section refers to the payload procedure classification, but applies to all U.S. PODF procedure classifications.

3.4.1 Nominal Operations Procedures

Nominal operations procedures are procedures used to carry out day-to-day operations of the systems or individual subsystem components. Preventative maintenance procedures and periodic maintenance procedures are included as nominal operations procedures to ensure continued satisfactory performance of these systems. In addition, transfer procedures are also included that involve transfer of cargo and crew between an Earth-To-Orbit Vehicle (ETOV), the Space Station, and Systems Operating Data Files.

3.4.1.1 Activation and Checkout (A&C) Procedures

A&C procedures are nominal procedures used to activate, power up, and check out systems or individual subsystem components. For the individual systems files, this encompasses the initial activation and checkout of the individual payloads and payload components, as well as activation and checkout of components after a powerdown.

3.4.2 Alternate Nominal Procedures

Alternate nominal procedures are procedures which accomplish a known payload or system configuration or objective using a sequence of steps that is different from the sequence desired the majority of the time. This different sequence is used based on criteria established by the procedure writer and/or science user and is well understood in advance to be a needed sequence for a significant minority of operations. Alternate procedures do not require additional resources, but may require a ECR in order to have the specific procedure identified in the On-board Short Term Plan (OSTP).

3.4.3   Quick-Response Procedures

Quick-response procedures are procedures used to quickly safe the system or payload in the event of a failure or anomaly in the nominal operation of the system or subsystem components. These procedures must be accomplished within a limited amount of time (approximately 5 minutes), in order to prevent propagation of failures to other systems or components and to prevent danger to the crew and/or the Space Station. Usually, execution of a malfunction procedure will follow, providing troubleshooting and corrective action steps. Examples of conditions that would require the execution of these procedures include, but are not limited to: Class 1 Alarms, which include fire, cabin depressurization, and toxic atmosphere; and Class 2 Alarms, which may include chemical spills and loss of vehicle control. An integrated payload safing procedure book will be collated from all payload quick-response files by the Payload Operations Integration Center (POIC)/POIF.

3.4.4   Malfunction Procedures

Malfunction procedures are procedures designed to cope with system or equipment failure requiring a diagnostic process to determine the nature of the failure and possible corrective action. If normal conditions cannot be restored, the extent of degradation and the effects on subsequent operations must also be assessed. These procedures are not normally considered time critical; however, they generally should be performed as soon as possible.

3.4.5   Corrective Procedures

Corrective procedures are procedures designed to bypass or overcome a failure condition. They may be referred to within a malfunction. These procedures permit continued systems operations and are not normally considered time critical; however, they should be performed as soon as possible.

3.4.6   Reference Information

Reference information is non-executable support data that has no specific format. This data is used as reference for the successful execution of a procedure. It is not a part of the actual procedure. Examples of reference information include lists of equipment lost when a bus malfunctions, caution and warning message definitions, inventory and stowage lists, Earth observation maps, and the definitions of the text and icons used in the C&DH systems displays. This category also includes diagrams and drawings used for system familiarization and diagnostic troubleshooting. Reference information will be hyper-linked within the MPV).

Reference information will also include a complete list of error messages and their explanations.

3.5   PROCEDURE FORMAT

Based on the tasks to be accomplished, procedures are fabricated and displayed in one of the following formats: checklist format, and logic flow format. There is no specific format which the reference information must follow, as long as the information presented is clear, concise, and can be comprehended by the user without difficulty. These formats are defined in Operations Data File (ODF) Standards, SSP 50253.

3.5.1   Checklist Format

Checklist procedures are a textual collection of sequential procedural steps requiring little or no branching. These procedures are step-by-step instructions that allow the crew to accomplish one task after another.

3.5.2   Logic Flow Format

Logic flow procedures are graphical representations of procedures which resemble computer flow charts. This format is useful for procedures that require branching and/or crew decision-making. It also allows the crew to follow the paths (branches) of the entire procedure and determine what results can be expected upon the completion of certain intermediate branches before the procedures are executed.

3.5.3   Reference Format

Reference information is used to present non-procedural information. Examples of such reference information include maps, charts, tables, support information, equipment identification, and caution and warning labels. References in paragraph form should follow clear text rules as identified in the ODF Standards (SSP 50253).

3.6   ON-BOARD CONFIGURATION

Most procedures and reference information used during an increment will exist in electronic media. This includes both executable and read-only procedures which are displayed electronically on board the Station and on the ground in the POIC/U.S. Payload Control Center (U.S. PCC) and Mission Control Center - Houston (MCC-H), user sites, IP Control Centers, etc.

From the point of view of weight, volume, and flexibility, electronically displayed procedures are ideal. They can be uplinked from the ground, take up no physical space (other than the storage media — compact discs, hard-drives, floppy diskettes, etc.) on board the ISS, and updates can be made by uplinking the latest version from the POIC/U.S. PCC. However,

for reasons of safety, time criticality, and accessibility, some procedures and reference information will exist in a paper media such as a physical book, checklist, or cue cards.

Safety-related, time-critical, and frequently accessed procedures may be made into cue cards or decals so they can be placed at or near a specific location. Certain procedures must be readily available in a paper format. For example, in the event of a malfunction in the C&DH system, the ability to access and execute the electronic procedures may be eliminated. In this situation, procedures that are needed to troubleshoot and recover the C&DH system must be in paper format. Some procedures which are not safety-critical must also be flown in a paper format for reasons of accessibility.

The electronic U.S. PODF procedures will be displayed on an interactive terminal that is part of the on-board workstation system. The "fixed" arrangement works well when the only crew interaction required is performed at the fixed Portable Computer System (PCS) locations. If a crewmember must perform a nominal payload procedure, or troubleshoot a failure at a location far removed from the fixed workstation's locations, the PCS can be used in a freestanding mode (after download of proper procedures and OSTP from the appropriate MSD (Mass Storage Device)). An electronic cuff checklist such as that proposed for the Extravehicular Activity (EVA) crewmembers might also be used if available. _The adoption of the OPS LAN server (wireless) and associated Station Support Computers (SSC) will result in the rewrite of this paragraph._

3.7   ON-BOARD SUPPLIES AND SUPPORT ITEMS

In addition to the U.S. PODF documentation, several items will be supplied to the crew on board the ISS. These items vary from office supplies to restraint hardware and are included to aid the crew in their execution of the procedures. An approved collection of these supplies has been accumulated for use with the Flight Data File (FDF) in the SSP. Currently, the approved items expected to be maintained on board the ISS include:

A.   Crew notebooks

B.   Book tethers

C.   EVA cuff checklist bag (not currently in baseline, but under discussion)

D.   Note pads

E.   Post-It™ note pads

F.   Book clips

G.   Book clamps

H.   Mechanical pencils and ink pens

I.   Grease pencils

J.   Stainless-steel rulers

K.   Erasers

L.   Rubber bands

M.   Adhesive tape

N.   Tape dispenser

O.   Velcro™

Additional information on these items can be found in the U.S. PODF Management Plan, Annex 4, U.S. PODF Preparation and Publication Plan, SSP 58700-ANX4.

3.8   U.S. PODF PRODUCT

The U.S. PODF contains a number of procedure files. Table 3-I contains a list of all of the currently defined files and identifies their Office of Primary Responsibility (OPR), procedure types, and the media contained therein. The following are descriptions of the contents of Table 3-I.

U.S. PODF FILE [OPR]

This field contains the file name, the OPR for management of the file, and a description of the file contents. The OPR has primary responsibility for the technical content and integrity of the procedures and reference information in the particular U.S. PODF file. A File Manager will be assigned by the OPR to develop and maintain an assigned file. The indicators used for the OPR are defined as the following:

PD - Payload Developer

POIF - Payload Operations Integration Function

PROCEDURE TYPE(S)

This field specifies the type of procedures the file contains (see definitions in Section 3.4).

PAPER PRODUCT

This field indicates the paper products associated with a particular U.S. PODF file. All procedures (except some maps, charts, and/or decals) will exist in electronic format. The *Percentage indicator* is an estimate of what percentage of the *total file* will be provided in the forms of *Cue Card, Flipbook, Decal,* and/or *Other* in addition to the electronic copy.

RATIONALE

Safety, time criticality, and accessibility are indications of why the listed paper products exist.

TABLE 3-I U.S. PODF FILES (Sheet 1 of 2)

U.S. PODF File [OPR]	Procedure Type(s)	Paper Product	Rationale
Payload Operations [PD] [POIF/POIC/US PCC] Procedures and reference information for Payload activation and checkout, nominal and off nominal operations, deactivation, alternate operations, maintenance, etc. Reference documents should include error message and schematics files.	Nominal Ops Alternate Corrective Malfunction Cue Cards Reference	TBD	TBD
Payload Command & Data Handling (C&DH) [POIF/POIC/US PCC] [PD] Contains the following procedures for use in association with the Payload C&DH operations: non-assembly related Payload C&DH specific procedures used to activate the C&DH system; all nominal and alternate-nominal Payload C&DH operations; display use; reference data and schematics and drawings.	Nominal Ops Reference Alt Noms	TBD	Accessibility Time Critical
Decals & Cue Cards [PD] [POIF/POIC/US PCC] Contains the list of decal and cue card locations, and contents of decals. Decals and cue cards are usually employed for often used procedures; crew Payload equipment operations; etc.	Nominal Ops Quick-response Malfunction Reference	TBD	Accessibility Time Critical
Payload Support Systems [PD] [POIF/POIC/US PCC] Contains the following procedures for use in association with the PLSS: non-assembly related payload support system specific procedures used to activate, checkout, and verify that the PLSS and individual payload support system components are operating properly; all nominal and off-nominal operations; maintenance procedures executed via displays; reference data and schematics and error messages and drawings. Also included are powerdown procedures. Procedures necessary to transfer, install, remove and safely activate payload with ISS payload services such as electrical power, data handling, or environmental control are also considered in this group. This includes payload operations procedures that are designated integrated payload/Payload Support System procedures. Integrated payload/Payload Support System procedures are defined as those which require the use of both payload and Payload Support System procedural steps or sequences to achieve a desired objective.	Nominal Ops Quick-response Malfunction Corrective Reference	TBD	Accessibility Time Critical
Integrated Payload Operations [PD] [POIF/POIC/US PCC] Procedures required to perform integrated payload activity.	TBD	TBD	TBD
Maps and Charts [PD] [POIF/POIC/US PCC] Atlases, world maps, and star charts.	Reference	TBD	TBD
Integrated TV/Photo Operations [POIF/POIC/US PCC] Integration of the partners TV/Photo Operations products, reference materials, historical documentation and PAO inputs. Television setup, activation, and deactivation procedures; camera operations, setup, activation, and deactivation procedures; camera displays and controls; camera/television malfunction procedures. Video Tape Recorder (VTR) setup activation, and deactivation procedures; VTR displays and controls; VTR malfunction procedures. The following procedures reside in the U.S. SODF and may be linked to/from the TV/Photo Ops files: Video Switching Unit (VSU) setup, activation and deactivation procedures; VSU displays and controls; VSU malfunction procedures. Video Baseband Signal Processor (VBSP) setup activation, and deactivation procedures; VBSP displays and controls; VBSP malfunction procedures. Backup onboard routing and commanding instructions.	Nominal Ops Reference	TBD	TBD

TABLE 3-I U.S. PODF FILES (Sheet 2 of 2)

U.S. PODF File [OPR]	Procedure Type(s)	Paper Product	Rationale
Payload Displays & Control Guide [POIF/POIC/US PCC] Contains definition of the text and icons that are part of the onboard and ground payload and Payload Support System displays. These files will address the display aspect of the human computer interface. The contents will be divided by software program and then by submodes of that program. The text on the display and the icons are explained according to pedagogical guidelines. The descriptions are at high level and no software flow charts are included. The C&DH dictionary file will have a section that will contain information generic to all PLSS and a section divided into payload specific display information.	Reference	TBD	TBD
Reference [PD] [POIF/POIC/US PCC] Reference data includes non-executable, ancillary information, to be used for reference for the successful execution of a procedure. Examples of reference information include lists of equipment lost when a bus or sub-bus is lost, caution and warning message definitions, inventory and stowage lists, payload to Payload Support System schematics, Earth observation maps and star charts, and definitions of the text and icons used in the C&DH Payload displays. This category also includes detailed high level overview diagrams and drawings used for Payload familiarization and diagnostic troubleshooting. Crew annotations might also be considered as reference material, but these files will be associated with specific procedures *(or procedure steps)*.	Reference	TBD	TBD

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SECTION 4, U.S. PODF STRUCTURE SUPPORTING INCREMENT OPERATIONS

The U.S. PODF will be composed of baseline files. The baseline files contain all procedures that are under continuous configuration control. These procedures may change frequently and can be independent or dependent on specific increments. Baseline files will be used to support a particular increments payload operations. There will exist at any given time a baselined file which is concurrently used for on-orbit operations as well as ground training. Changes to payload (or PLSS) procedures as a result of training or on-board operations will be coordinated through the PODFCB. Changes which are not increment specific may filter back into training and on-board documents. Increment-specific changes will likely only affect the on-board operations and will not be reflected in training material. Figure 4-1 is a graphical representation of the U.S. PODF structure.
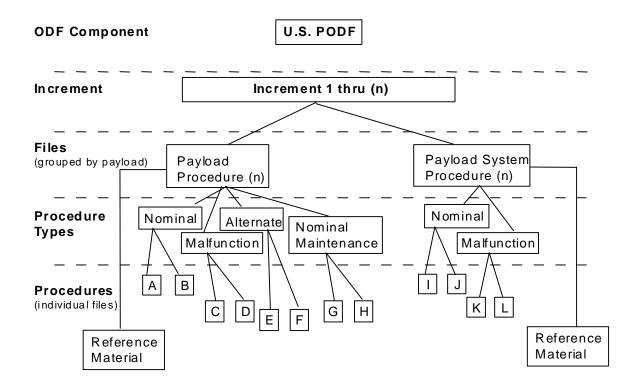

FIGURE 4-1 INCREMENT U.S. PODF/PUBLICATION TYPES

4.1   BASELINE FILE

There is a baseline file for each procedure in the U.S. PODF. These files will contain those procedures that are under continuous configuration control. Modifications to any procedure in this file will require ECRs approved by the PODFCB. The procedures and reference information contained therein may be independent of increment-unique aspects such as Station assembly phase or increment-specific payload requirements. Within the baseline files exist three sub-categories: generic, multi-increment, and update files.

Generic files contain procedures that are planned for use in more than one increment, have been thoroughly validated, and will remain stable without significant changes. They will follow the template for the first Increment submitted and be baselined with them and from multi-increment files contain the following:

A.   Procedures that will be used for multiple, consecutive increments.

B.   Procedures that will be used for multiple but not consecutive increments.

C.   Common procedures with several versions.

D.   Generic procedures with increment-unique data.

Update files contain new procedures, procedures that are still under development, existing procedures with major additions and/or changes, procedures which are only applicable to a specific increment and/or procedures only used for a few consecutive increments and not re-flown later. Some update files are increment-unique and are not shared with other increments. The update file designation follows and records the more extensive validation processes required for new procedures. Update files also contain the procedures that require major changes between increments (e.g., assembly).

4.2   INCREMENT U.S. PODF STRUCTURE SHEET

The Increment U.S. PODF Structure Sheet is used to define the procedures and reference data that will be incorporated into a particular increment. An example of this structure sheet can be found in Annex 4 of the U.S. PODF Management Plan. Maintenance and publication of the Increment U.S. PODF Structure Sheet is the responsibility of the PODFCB with direct contribution from the U.S. PODF Increment Manager.

The Increment U.S. PODF Structure Sheet serves as a guide in building the increment structure within the PIMS (OPMS), and aids in resolving issues regarding procedure development responsibility.

Only one Increment U.S. PODF Structure Sheet will be published for each ISS increment. The U.S. PODF Definition document is intended to be used in conjunction with the Increment U.S. PODF Structure Sheet.

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SECTION 5, PROCEDURE RESIDENCY

Most procedures used in the operation and maintenance of U.S. Payloads, LSE, and PLSS are maintained in U.S. PODF files. However, joint Shuttle/Station operations require a division of procedures between U.S. PODF files and SSP FDF. POIC/U.S. PCC will determine if there is a residency issue with a particular procedure. If there is a question of primary residency (Station or Shuttle), the POIC/U.S. PCC will resolve it with JSC counterparts.

Procedure residency, at times, will be determined on a case-by-case basis, depending on the phases of flight of the Orbiter. Duplication of procedural steps between FDF and U.S. PODF will be kept to a minimum. Duplicated procedures that are managed in both the FDF and U.S. PODF must be approved by both the Crew Procedures Control Board (CPCB) and the PODFCB.

5.1   ASCENT/RENDEZVOUS/ORBIT OPS PHASE

Procedures for Station payloads that require Orbiter resources or crew time prior to their transfer to the Station will reside in the Shuttle FDF. A copy of these procedures may reside in the U.S. PODF as reference.

The orbit operations phase might include crew and ground controller assembly, activation and checkout operations, and execution of payload/Detailed Test Objectives (DTO) for science and payload maintenance and housekeeping. During the orbit operations phase, when the Shuttle is docked to the Station, the Shuttle and Station can execute from both FDF and ODF procedures separately. Some procedures that support joint Shuttle/Station payload operations will be duplicated in the FDF and the U.S. PODF. All U.S. payload procedures on board the Station will be located in the U.S. PODF.

Procedures for payload transfer between the Shuttle and Station are called payload transfer procedures. Also included are procedures which involve the transfer of items from the Orbiter and Mini-Pressurized Logistics Module (MPLM) stowage location to the Station stowage location and vice versa. The listing of U.S. PODF inventory and stowage items is included in the Inventory Management System (IMS). Transfer from Orbiter is FDF. Transfer from MPLM is U.S. Systems Operations Data File (SODF).

5.2   DEORBIT/ENTRY PHASE

The deorbit/entry phase includes undocking, separation operations, deorbit prep/deorbit, and entry operations. During the deorbit/entry phase, the Shuttle and Station

will execute from separate procedures. The Shuttle will execute from the Flight Plan and other FDF documents, and the Station will execute from the OSTP and the U.S. PODF.

Flight-specific nominal and contingency integrated Orbiter/Station payload procedures for undocking (prior to Orbiter departure) and separation/proximity operations procedures (post-Orbiter departure) will be developed by the payload developer and POIC/U.S. PCC, and then turned over to the FDF. Procedures required for the preparation of the payload for Orbiter departure, Station maneuver to attitude, and Station post-departure reconfiguration will be part of the U.S. PODF.

APPENDIX A

ABBREVIATIONS AND ACRONYMS

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A, ABBREVIATIONS AND ACRONYMS

A&C	Activation and Checkout
ASI	Agenzia Spaziale Italiana
C&DH	Command and Data Handling
CPCB	Crew Procedure Control Board
~~CR~~	~~Change Request~~
DTO	Detailed Test Objective
ECR	Engineering Change Request
ETO	Earth To Orbit
ETOV	Earth-To-Orbit Vehicle
EVA	Extravehicular Activity
FDF	Flight Data File
I	Increment
IMS	Inventory Management System
IP	International Partner
ISS	International Space Station
ISSP	International Space Station Program
JSC	Johnson Space Center
L-	Launch minus
LSE	Laboratory Support Equipment
Mals	Malfunction (Procedures)
MCC-H	Mission Control Center - Houston
MOD	Mission Operations Directorate (JSC)
MOL	Mission Operations Laboratory (MSFC)
MPLM	Mini-Pressurized Logistics Module
MPV	Manual Procedures Viewer
MSD	Mass Storage Device
MSFC	Marshall Space Flight Center
NASA	National Aeronautics and Space Administration

ODF	Operations Data File
ODFCB	Operations Data File Control Board
OPMS	Online Project Management System
OPR	Office of Primary Responsibility
OSTP	On-board Short Term Plan
PCS	Portable Computer System
PD	Payload Developer
PIMS	Payload Information Management System
PLSS	Payload Support Systems
PODFCB	U.S. PODF Control Board
POIC	Payload Operations Integration Center
POIF	Payload Operations Integration Function
PV	Procedures Validation
SSC	Station Support Computer
SSP	Space Shuttle Program
U.S. PODF	United States Payload Operations Data File
U.S. PCC	United States Payload Control Center
U.S. SODF	United States Systems Operations Data File

APPENDIX B

GLOSSARY OF TERMS

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B, GLOSSARY OF TERMS

Activation and checkout procedures - Nominal procedures used to activate, power up, and check out payload/PLSS, or individual payload/PLSS components.

Baseline file - The baseline file contains procedures which are used in an increment.

Branching - Step within a procedure in which a user or computer is required to make a choice. The procedural steps executed will differ depending on the choice.

Checklist procedures - Textual collection of sequential actions. Step-by-step instructions requiring little or no branching.

Command - Action to be completed in support of an on-orbit task. In real-time, this action may be completed by crewmembers or ground controllers and can be accomplished manually, interactively, or via computer.

Configuration control - The processes and policies associated with the management and coordination of contents of the U.S. PODF that have been approved for use in operations.

Cue card - Non-electronic form of a procedure or reference information that is in an abbreviated format.

Decal - Procedure or procedures affixed to a structure at a location where a repetitive task (such as a hatch opening) is performed. Decals are also used to present information other than that directly related to a specific procedure (e.g., equipment identification).

Failure - Inability of a payload, PLSS, component, or part to perform its designated/required function within specified limits, under specified conditions for a specified duration.

File - Logical grouping of procedures and associated reference information in the U.S. PODF. Files are divided into sections (e.g., operations, malfunction, quick-response) and are similar to FDF books of the SSP.

Flight Data File - Total on-board complement of documentation and related aids available to the crew of the Space Shuttle for flight execution.

Hard copy - Procedure or associated reference information that will exist on board ISS in a paper form as a backup to the electronic procedure or associated reference information.

Icon - Pictorial or symbolic representation of a function, payload/element, or payload/element status which can provide access via direct manipulation to additional elements.

Increment U.S. PODF structure sheet - Specifies the procedures and associated reference information of an associated increment U.S. PODF required for the successful execution of an increment. Each increment U.S. PODF has one and only one structure sheet. Information included in the structure sheet may include a list of applicable procedure identification, responsible File Manager, procedure milestone dates, and Procedures Validation (PV) status.

Increment - Mission planning element, comprising all operations during the interval between two designated (not necessarily consecutive) Earth-To-Orbit (ETO) vehicle arrivals at the Space Station and all pre-launch planning and preparatory activities associated with this time period. For U.S. PODF purposes, this will generally be from crew launch to crew launch.

Integrated payload/PLSS procedures - Procedures requiring the use of both payload and PLSS procedural steps or sequences to achieve a desired objective, with the exception of those payload procedures involving only the basic payload support for power supply, data handling, or thermal control.

Maintenance - Function of keeping ISS payloads in, or restoring them to, operational conditions. Maintenance may be crew hands-on or computer initiated (via displays).

Maintenance procedures - A subset of nominal procedures used to maintain payloads or PLSS or LSE. Includes activities such as filter changeout/cleaning and load cycling. Maintenance procedures may be crew hands-on or executed via displays.

Malfunction procedures - Procedures used to cope with a payload or equipment failure that requires a diagnostic process to determine the nature of the failure, possible corrective action, and, if normal conditions cannot be restored, the extent of degradation and the effects on subsequent operations.

Manual execution - Execution technique in which a command is executed manually (e.g., opening a hatch by hand rather than opening it automatically).

Manual Procedures Viewer (MPV) - Software used on-board and on the ground to view the manual procedures.

Media - Means of communicating procedures or reference information to the crew on board the ISS. Consists of electronic, paper books and checklists, cue cards, and decals.

Nominal operations - That portion of the increment during which planned ISS payload operations are carried out free from the influence of Shuttle arrival or departure or

from malfunctions and failures. Can also be described as procedures used to carry out the day-to-day operation of the payload/PLSS or individual payload/PLSS components.

Online Project Management System (OPMS) - Web based system used for the deposit of procedures to the U.S. PODF.

Office of Primary Responsibility - Organization identified as being responsible for the development, production, distribution, and management of a particular checklist or file. The responsible organization assigns files to the file managers and approves the files and associated reference information and records contained in them.

Operations - Day-to-day sequences of activities associated with PLSS, PLSS processes, experiments, and payloads on board the ISS or on the ground in support of the on-board activities.

Payload - Specific aggregate of equipment, software, specimens, and/or other items that is designated and treated as a collective whole in support of one of more experiments. An individual payload may be uniquely associated with one experiment, or it may serve as common use equipment for a group of experiments.

Payload Operations Data File Control Board - Governing body responsible for configuration management of U.S. PODF.

U.S. Payload Operations Data File - Procedures, reference information, and associated auxiliary information required for the support of U.S. payload operations. The U.S. PODF includes nominal, activation and checkout, alternate, quick-response, and malfunction procedures required for payload, PLSS and LSE operations, and associated reference information (e.g., schematics).

Payload Operations Integration Center - Facility that will integrate selected Station-wide user payload operations activities. This includes the integration of Station-wide user safety and operations.

Payload Information Management System - The system used for the configuration management and storage of U.S. PODF procedures.

Portable Computer System - Crew computer system consisting of processor, keyboard, trackball, hand controllers, primary display, and secondary displays. The PCS is the device used by the crew to interact with the C&DH.

Powerdown - Procedures used to intentionally and methodically remove power from and cease operations of payloads or selected PLSS/LSE for the purpose of power conservation, load switching, maintenance, or diagnostic troubleshooting.

Procedure - Approved method of attaining an objective through the execution of a predetermined sequence of steps (actions or commands). Procedural goals include accomplishing a desired action or condition, obtaining or generating information, or all of the above. A procedure can be automated, manual, or semi-automated and used by the crew, the software, or ground operators.

Procedure executor software - A software that executes the procedures embodied in a compiled procedure script. This software reads and responds to a set of real-time commands that allows a user to control script execution.

Quick-response procedures - Procedures used to quickly safe the system or payload in the event of a failure or anomaly in the nominal operation of the system or subsystem components. These procedures must be accomplished within a limited amount of time (approximately 5 minutes), in order to prevent propagation of failures to other systems or components and to prevent danger to the crew and/or the Space Station.

Reference information - Non-executable information potentially required for the successful execution of a procedure (e.g., schematics, and photographs).

Schematics/drawings - Detailed high-level overview diagrams and drawings used for payload familiarization, diagnostic troubleshooting, or equipment location.

Segment - All on-orbit hardware and software belonging to an ISS participant.

Space Station Control Center (SSCC) - Based at JSC, the SSCC will perform Station system management and interact with the POIC/U.S. PCC at MSFC. The SSCC has overall ISSP planning and scheduling responsibility for ISS operations.

Step - Logical break of operations based on factors such as location, crewmember, time, hardware, events, etc.

United States Partner Control Center (U.S. PCC) - Facility that will integrate all US user payload operations activities. This includes the development of the integrated user operations plans and real-time management of user operations.